

Subject: Cooling Minutes - April 2, 2002

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Hi All,

Here are the minutes from yesterday's meeting:

1. Laser Welding Results from Last Week: We had some significant problems with laser welding on my last trip to EB industries. For some reason (yet to be determined) the welds looked fine but did not leak check. Some of this may be due to problems with the leak check setup (we had no good way to seal to the fitting), but at least some of the welds showed cracking in the last laser pulse of the weld. We experimented with laser settings and arrived at essentially the ones that Jim started with (meaning that no change to the power, pulse width, graduation, etc. made things any better). After some brainstorming, we decided that the problem is most likely due to the fitting material, which we changed from 6063 to 6061 when we made the last round of fittings (we considered the tubing material at the time to be the more important of the two). Jim has already experimentally succeeded in welding capillaries to fittings by using a filler of 4047 aluminum (this was after my visit). However, this technique does not appear to be as suitable for the larger sized tubes, since the 4047 comes in limited sizes and shapes (foil and rod). In order to test the "fitting material" theory, we will be making several "dummy" fitting pieces here, which we will use to conduct a test matrix of welds at EB. See item 3.

2. Laser Weld Samples: Tom Weber has taken all of the welded samples from my visit to EB and will catalog them, assigning each piece a number. I will make a short log of each sample, with pictures of the welds (which Tom will be taking soon under a scope), alloy compositions of the materials, and vacuum check results from each weld. Tom will vac check all of the welds as best he can before we make a better seal for this process (see item 4). A list of the samples that I brought back is below:

- 2 Indium sector tubes
- 2 Luer sector tubes
- 1 complete u-tube (potentially leak free)
- 1 bent u-tube
- 1 cut-in-half u-tube
- 2 Luer capillaries
- 1 Luer 4 mm exhaust section (~8" long)
- 2 CERN stave tube samples (welded both ends)

3. Dummy Fittings: We will be making "dummy" fittings from both 6063 and 6061 (shop stock). The 6063 is currently being analyzed for composition (see item 5) and the shop stock will be sent out for analysis when they begin making parts. We will be making 20 dummy fittings of each type of material, with 10 being bored out for the 4 mm 3003 tubing (3/16" OD) and 10 being bored out for the sector swaged tubing (0.177" OD). This of course means that we need 20 short, swaged lengths of sector tubing, with at least one end swaged. We will only weld one fitting to each piece, but we need to be able to plug the opposite end of the tube for leak checking, and this may be easiest if it's swaged round. Jon Wirth will put this job into the shop so that he can follow it and provide the 6063 material that is currently in his lab. The drawing is located at:

http://www-eng.lbl.gov/~hartman/pixel/cooling/21F5721_FITTING_TEST_WELD_DUMMY.pdf

4. Leak Check Seal: Fred is going to cast a rubber vac check seal for the indium and luer sector fittings (ideally one casting will fit both). This will be made from RTV and then bonded to a tygon tube that can be attached to a fitting on the leak checker. In particular, he will make sure it can be used on the sector tubes without removing any of the carrier tooling, which will keep the welds and tubes protected. Jim Fox is in desperate need of a seal like this so he can make reliable leak checks after welding (we had major problems with this when I was there - we simply couldn't find spare tubing or plugs that would seal well). The rubber seal will work with the real and dummy fittings.

5. Fti Anamet: I sent out 8 aluminum samples for compositional analysis last week. Results should be back this week or early next week. The 8 samples are as follows:

3/8" Round 6063 Stock
1/2" Round 6063 Stock
6063 Variseal Flange
Luer Sector Fitting (6061?)
Indium Sector Fitting (6061?)
7/64" tubing (2 mm ID)
1/16" tubing (second batch of capillary)
3/16" tubing (second batch of 4 mm tubing)

6. Sector Carrier Rework: Jon and Tom J. are going to rework the carriers with some minor modifications. In general, they worked very well, but a few things need to be changed - the front and bottom need to be faced flat, the fitting holder (L-bracket) needs to be moved down to allow more fitting clearance on the indium carriers, the strain reliefs need to be incorporated on the tube so that it isn't so easy to pull the tube up and bend it (right now it's held with a foam cushion between it and the clamp plate).

7. Fitting Test Glue Extension: Fred is swamped with work, so he does not have time to machine the glue extension pieces (for attaching a swagelock to the fitting assembly) himself. I have drawn up the part and acquired some aluminum tubing of the proper size, so I will provide these to Jon W. and he can put them into the shop along with the dummy fitting pieces. We need 10 extension pieces for each type of fitting, so 20 in total. The drawing for these pieces can be found at:

http://www-eng.lbl.gov/~hartman/pixel/cooling/21F5581-2_FITTING_TEST_GLUE_EXTENSION.pdf

Let me know if I missed anything! Thanks for all the good work.

Neal